Non-Toxic Quantum Dots for Energy

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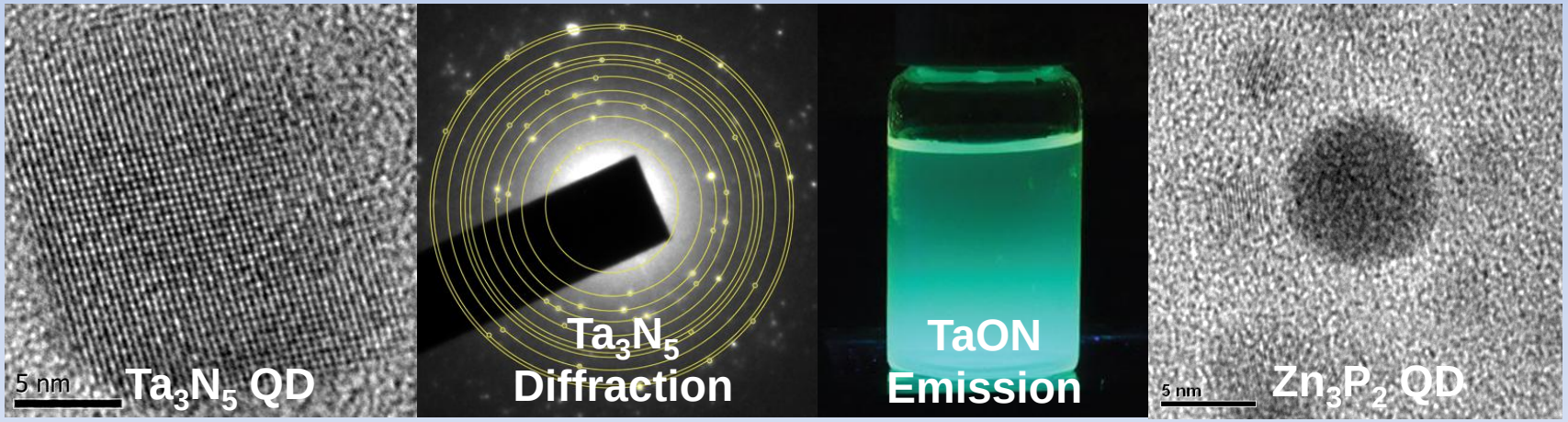
The generation of alternative, renewable energy is essential towards sustaining economic stability and for environmental protection. Solar energy collection and H_2 production are important processes toward this goal; however, many light-harvesting systems are made of highly toxic elements. We have addressed this issue by creating environmentally–benign tantalum nitride, tantalum oxynitride, and zinc phosphide nanocrystals. The tantalum compounds are thought to be catalytically active for water-splitting, while zinc phosphide is an important component in next-generation solar cells. Specifically:



1) Tantalum nitride (Ta_3N_5) nanocrystals were synthesized using methods employed to create quantum dots. Unfortunately, the reaction yields were found to be low.

2) Tantalum oxynitride (TaON) was synthesized using a sol-gel method that produces large quantities of materials; furthermore, we can show that TaON is useful for waste-water remediation.

3) Zinc phosphide (Zn_3P_2) quantum dots have been synthesized. It was also found that our Zn_3P_2 QDs are highly stable against oxidation in air, which is an important property if these materials are to be used in solar cells.